CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY

Name(s)
Jaena Han

Project Number
J1813

Project Title
Natural vs. Pharmaceutical Antibiotics

Abstract

Objectives/Goals
I conducted this experiment to determine whether natural or pharmaceutical antibiotics would be better at preventing antibiotic resistance from occurring within E. coli strain ATCC25922.

Methods/Materials
A turbidity measurement was performed to guarantee that each antibiotic had an initial antimicrobial effect against E. coli strain ATCC25922. Then, the E. coli was exposed to the two pharmaceutical antibiotics (Ampicillin and Cyprofloxacin Hydrochloride) and two natural antibiotics (garlic and honey) that had been tested, for increasing lengths of time, beginning at 2 hours of exposure and concluding after 12 hours of exposure. After each exposure, a susceptibility test was performed to determine how sensitive the bacteria were to the effects of each antibiotic. The point at which the E. coli developed an antibiotic resistance was determined when the diameter of the inhibition zone decreased below its standards for susceptibility.

Results
The turbidity measurement indicated every antibiotic tested had some degree of growth inhibition. By the end of the susceptibility tests, garlic had no inhibition zone, and the inhibition zone of Ampicillin had decreased about 3.3 mm from 17 mm to 13.7 mm, which is below its zone diameter standards for antibiotic susceptibility. The inhibition zone of honey, however, decreased by only 1mm from 13 mm to 12 mm, the least significant decrease among all the antibiotics, and the inhibition zone of Cipro decreased 3 mm from 35 mm to 32 mm: not enough for it to be considered ineffective. Therefore, the E. coli developed resistance to garlic and Ampicillin but not to Honey or Cipro.

Conclusions/Discussion
The results were inconclusive, as the E. coli developed resistance to one natural and one pharmaceutical antibiotic and failed to develop resistance to one natural and one pharmaceutical antibiotic: an even split. Perhaps there is no correlation between whether an antibiotic is natural or pharmaceutical and its ability to prevent bacteria from developing resistances. However, it should be taken into consideration that this experiment encompassed a very limited number of antibiotics which may not accurately represent most antibiotics, both natural and pharmaceutical. Moreover, there is a high possibility that Cipro, garlic and honey did not have correct concentrations or were inadequately dosed, potentially skewing the results.

Summary Statement
The purpose of this expiriment was to determine whether natural antibiotics would be more effective in preventing antibiotic resistance from occuring in E. coli bacteria over longer durations than pharmaceutical antibiotics.

Help Received
Used lab equipment at The Scripps Research Institute under the supervision of Angela Baik; Lindsey A.Miles allowed me to use lab equipment; Neill Gingles provided E. coli strain; Hongdong Bai gave technical advice on methods of culturing E. coli.